
**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

Revision of Part 15 of the Commission's Rules to ET Docket No. 13-49
Permit Unlicensed National Information
Infrastructure (U-NII) Devices in the 5 GHz
Band

Via the ECFS

REPLY COMMENTS OF IEEE 802

1. IEEE 802¹ respectfully submits its Reply Comments in the above-captioned Proceeding².
2. IEEE 802, as a leading consensus-based industry standards body, produces standards for wireless networking devices, including wireless local area networks ("WLANs"), wireless personal area networks ("WPANs"), wireless metropolitan area networks ("Wireless MANs"), and wireless regional area networks ("WRANs"). Included in our standards development activity is an emphasis on coexistence, which is the focus of our Wireless Coexistence working group. We appreciate the opportunity to provide these comments to the FCC.

PREFACE

3. On February 20, 2013 the Commission issued a Notice of Proposed Rulemaking, under ET Docket 13-49, in which the Commission seeks comments on revision of the rules for the 5 GHz U-NII band and other related matters.

1 The IEEE Local and Metropolitan Area Networks Standards Committee ("IEEE 802" or the "LMSC").

2 This document represents the views of IEEE 802. It does not necessarily represent the views of the IEEE as a whole or the IEEE Standards Association as a whole.

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4. IEEE 802 submitted Comments to this proceeding and we take this opportunity to followup by submitting these Reply Comments.
 5. IEEE 802 especially thanks the Commission for extending the deadline for Reply Comments, which gave us the opportunity to file this response in a timely fashion.

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I. Introduction

6. IEEE 802 believes that the comments filed in the above-captioned proceeding represent significant alignment on a number of issues, both procedural and substantive. Agreement exists on a number of rule changes that would serve to improve U-NII operations in the existing 5 GHz sub-bands, and on a process the Commission can use to reach determination on issues for which additional technical due diligence will be needed. Moreover, the record paints a compelling picture of how IEEE 802.11 technologies are contributing to national broadband goals, economic growth, jobs, innovation, and even providing a relief valve for mobile operators facing a spectrum shortages. The trend lines are explosive and exponential. The numbers of devices certified for interoperability, of growing hotspots, of the computing power of IEEE 802.11ac technologies – are impressive. Even incumbent licensees who are focused on interference protection for their radio systems have recognized that a thorough examination of whether the Commission could make the band more useful for U-NII devices is a timely and important discussion to have. We agree.
7. In its comments, IEEE 802 recommended that, given the breadth of issues raised in the Notice of Proposed Rulemaking³, the Commission resolve the questions before it in groups, addressing each group in the most expeditious manner possible. IEEE 802 is pleased that a number of commenters agree that the Commission should segregate and act on “low hanging fruit” while resolving remaining issues as soon as decisions are ready. Proposed rule changes supported by a unanimous record and those which are ready because an extensive record exists, can be resolved quickly. The resulting rule changes will immediately improve operations in the 5 GHz band for existing devices and early deployments of IEEE 802.11ac devices. As the commenters note with respect to the proposals to open U-NII-4 and U-NIII-2B, sharing solutions and technologies need to be thoroughly examined and those issues can be expected to take time to resolve, with a need for both industry-to-industry discussions as well as the involvement of both the Commission and the National Telecommunications and Information Administration (NTIA). We agree.
8. Below, IEEE 802 summarizes the actions that it believes the Commission could take initially to lay the foundation for improved use of 5 GHz by U-NIIs.
9. IEEE 802 and its members are prepared to assist the Commission in order to begin to resolve the issues in this important docket. We believe the Commission can and should issue its first Report

³ In the Matter of Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, ET Docket No. 13-49, Notice of Proposed Rulemaking, released Feb. 20, 2013.

and Order in this proceeding in the fourth calendar quarter of this year or soon thereafter. Because the markets enabled by IEEE 802.11 technologies are global, we are mindful of the important precedent that the Commission will be setting for other regulators around the world. The explosive growth that we are witnessing in the use of IEEE 802.11 radio local area networks (RLANs) requires prompt and thoughtful regulatory action which will coincidentally help to frame the debate for regulators everywhere. Accordingly, we find suggestions that the Commission do nothing unless and until there is a change in ITU regulations to be ill-informed.⁴ As the record amply demonstrates, IEEE 802.11 technology is too important to consumers, businesses, service providers, and to national economies, to delay. Spectrum rules that best enable the next generation of IEEE 802.11 technology, and which will meet the rising tide of consumer and business demand, are essential as IEEE 802.11 RLANs become the primary on and off ramp to the Internet.

II. Unlicensed devices are playing an important and critical role in meeting wireless data needs

10. For the Commission to dedicate staff resources to a proceeding as wide-ranging and technical as this one, there needs to be a motivating driver. IEEE 802 asserts that the Commission look no further than the comments. Filing after filing reveals breathtaking advancements in how technology enabled by IEEE 802 standards is being utilized.
11. While the record is extensive, IEEE 802 wishes to call out a few of the most salient points:
 - IEEE 802.11 technology is becoming the dominant means for accessing the Internet globally.⁵
 - As the ways in which powerful smartphone, tablet, laptop and other devices are used have changed, and the amount of information exchanged over wireless media has increased, the 2.4 GHz band has become congested in urban areas, necessitating increased utilization of the 5 GHz band.⁶

⁴ European Space Agency (ESA) at 2.

⁵ By 2016, Wi-Fi will be delivering approximately the same volume of Internet data as wired connections. Cisco at 8.

⁶ NCTA submitted a study demonstrating through demand analysis the need for additional spectrum as existing spectrum becomes more congested. NCTA at 8-9 and Attachment. As of December 2012, 174 million of the 326 million connections to US mobile networks consisted of smartphones, laptops, tablets or modems – driving data consumption. TIA at 4. See also IEEE 802.11 at 8.

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- Looking ahead to the future, rising demand by users for information exchange necessitates increased capacity of the wireless broadband connections that carry the information and IEEE 802.11/Wi-Fi™ is no exception - this is part of the inevitable evolution to faster and better technology.⁷
 - IEEE 802.11ac is projected to become the predominant Wireless Local Area Networks (“WLAN”) technology in a few years.⁸
 - The range of devices and applications based on IEEE 802.11 is exploding.⁹
 - Mobile, cable and wireline operators are integrating IEEE 802.11 technology into their networks, investing in significant build outs of network infrastructure. They consider WLAN technology as an essential part of their offer.¹⁰

12. These facts highlight that the role of unlicensed devices in the national economy and in meeting user demand is now so important that it requires a close examination of how the 5 GHz band can best be utilized to enable continued expansion of this technology.¹¹ In the course of this proceeding, the Commission is going to need to make a series of decisions for each of the sub-bands identified in the Notice. In IEEE 802’s view, those decisions need to be weighed with one eye on the remarkable importance of IEEE 802.11 technology to meet the growing demand for wireless technologies that efficiently and effectively move large amounts of data. IEEE 802.11 has designed IEEE 802.11ac technologies to use existing 5 GHz spectrum, and Commission adoption of the proposed rules and expanding access to spectrum will enable the technology to evolve to its highest and best use. The need for expanded spectrum access is clearly evident from this record.

7 Cisco submitted a study from the Plum Group discussing the drive to increase speeds at the edge of the Internet and what that means for 802.11 devices. Plum concluded that Wi-Fi needs to deliver speeds consistent, on a shared contended basis, with available broadband access speeds (around 100 Mbps by 2020) and capable of meeting for short durations (with low likelihood of contention) high speed device-to-device connectivity needs (1 Gbps or more). Second, Wi-Fi needs to be able to deliver these speeds while meeting demand from multiple simultaneous competing uses. To achieve this, Wi-Fi must be able to access more spectrum in the 5 GHz bands. Additional 5 GHz spectrum could double the capacity of Wi-Fi. Cisco at 22-23 and Appendix.

8 By 2015, nearly one billion .11ac devices will ship globally. Cisco at 21.

9 WFA at 1, 3-4, Cisco at 10-11, CEA at 6-7, AAMI at 2-3.

10 NCTA at 1-6, Time Warner Cable at 5-6, Cablevision at 2-3, Cisco at 12-16, TIA at 4-6.

11 This level of connectivity has resulted in a total economic gain for all households of around \$52-\$99 billion annually. WFA at 5. See also Google/Microsoft at 1-2.

III. Record provides strong support for issuing a series of final decisions to improve U-NII operations in the band as soon as possible.

13. IEEE 802, joined by several parties, strongly counselled in its comments that early action on portions of the docket is preferable to issuing a single Report and Order once all of the issues are ready for resolution.¹² As the commenters noted, the issues raised by the Notice address multiple sub-bands, and constitute a range of issues from improvements in rules affecting existing bands to entirely novel sharing problems that will need to be resolved. Given the growing demand for and use of IEEE 802.11 U-NII devices, the Commission should organize its work into a series of final decisions, taking action on the various issues in a prudent and expeditious manner. By resolving issues in this way, the Commission can immediately generate benefits to users and manufacturers.
14. Significant alignment among commenters supports these views. Numerous commenters agreed that the Commission should resolve the issues that have rendered 5600-5650 MHz unusable, including proposed rule changes affecting the DFS bands (U-NII-2A and U-NII-2C) as well as U-NII-3, since it has been U-NII-3 certificated devices (operated illegally in U-NII-2C) that have been the source of much of the TDWR interference.¹³ The issues affecting U-NII-2C are well-understood and, as will be discussed below, there is substantial agreement that the Commission has proposed an acceptable and comprehensive plan to correct root causes of the interference cases. In addition to immediately improving the DFS rules and protecting TDWRs, the Commission could adopt a number of rules for which there was no opposition and broad endorsement by industry commenters. These rules, for example, include expanding the U-NII rules to 5825-5850 MHz, an idea that received unanimous endorsement.¹⁴
15. Comments also revealed substantial agreement that issues involving U-NII-1 operations form a second logical group as there are specific concerns with mobile satellite feeder links to be resolved. Similarly, there are several issues that must be addressed before allowing U-NII operations in the U-NII-4 band, issues that are unique to that band and which form a third logical group. Foremost among these issues is sharing with Dedicated Short Range Communications devices that have been

¹² IEEE Comments at 3, 12; TIA at 2-3, 8-9; NCTA at 13; Time Warner Cable at 3; WFA at 7; Cisco at 24.

¹³ IEEE 802.11 at 3; WFA at 7; Cisco at 15.

¹⁴ IEEE 802.11 at 17; WFA at 11-12; Ericsson at 4; NCTA at 17; TIA at 11; Cisco at 42; Motorola Mobility at 2, 3; Fastback at 2; First Step at 3; WISPA at 12.

developed under the IEEE 802.11p standard. Finally, commenters noted that the issues in the U-NII-2B band, which also raise novel sharing questions, represent a fourth logical grouping. IEEE 802 urges the Commission to heed the commenters' recommendations and expeditiously proceed to final decisions as the various issues on record get resolved. Such an approach will maximize benefits to users by allowing for improved use of the 5 GHz band and better enable IEEE 802.11ac technology to address the many demands thereon.

16. Moreover, given the well-developed record on some of these issues, the Commission could begin issuing decisions late this calendar year, or soon thereafter. Commenters, citing the rising demand for IEEE 802.11ac technologies, strongly urged prompt action.¹⁵ TIA, for example, stated that NTIA has set for itself a public schedule of when it would produce the studies, and urged the Commission to similarly set out milestones for its work.¹⁶ The more certainty the Commission could provide on timing for its decisions, the better prepared industry will be to respond.

IV. Record reveals the importance of contiguous spectrum and harmonization of rules across sub-bands, while targeting sharing solutions to specific bands

17. Commenters agreed with the Commission that to achieve the full benefits of next generation technology, it is important to create a set of rules that will enable channel bandwidths of 80 and 160 MHz such as those specified in IEEE 802.11ac. Accordingly, there was broad support for harmonizing emissions rules wherever possible, harmonizing outdoor use where possible, and limiting sharing mechanisms to the specific bands where they are needed, as sharing technologies are not “cost-free.” IEEE 802 agrees.
18. At the same time, however, there was uniform recognition among commenters that unlicensed devices must not cause harmful interference to incumbent licensed or federal operations, including DSRC users of ITS spectrum, and general agreement among many commenters that working through the sharing problems at a technical level has merit. While a few commenters dismissed the

¹⁵ IEEE 802.11 at 13; WFA at 7; Cisco at 25; TIA at 11, NCTA at 3.

¹⁶ TIA at 8.

notion that “their” spectrum can or should be shared with unlicensed devices,¹⁷ most commenters signalled their willingness to work with the Commission to determine whether, and under what conditions, U-NIIs might be able to share the band.¹⁸ With skyrocketing demand for commercial broadband wireless technology and services, IEEE 802 appreciates those parties willing to engage in technical discussions and analysis that must precede a Commission decision to allow U-NIIs to operate in new spectrum, or to substantially alter the rules for operating in bands where U-NII devices already exist. In the view of IEEE 802, a data-driven analysis, including rigorous testing where needed, is the best approach to ensuring that spectrum resources are put to work for the greatest possible public benefit. IEEE 802 urges the Commission to remind all interested parties that time tested administrative processes, which give all parties due process, govern its decisions about whether and how to utilize spectrum resources.

19. The comments highlighted strong alignment around attempting to harmonize emissions rules to enable IEEE 802.11ac technology to take maximum advantage of the 5 GHz band. With respect to U-NII-1, a number of parties, including IEEE 802, noted the benefits that would flow from alignment with U-NII-2A rules, creating 200 MHz of contiguous spectrum. Other parties highlighted the advantages of harmonizing U-NII-1 with U-NII-3 rules due to the need to find spectrum that will work for outdoor use.¹⁹ This is of particular interest to the cable industry which is in the process of deploying many massive outdoor WLAN networks. After reviewing the comments, IEEE 802 joins those parties who believe the Commission should explore the possibility of adopting U-NII-3 rules for the U-NII-1 band, including outdoor use. If such a result were possible, then under U-NII-3 rules, manufacturers would have the flexibility of producing equipment for U-NII-1 that harmonized with either U-NII-2A or U-NII-3.

There is also broad interest within the WLAN industry to have a category of lower power devices created which would operate in DFS bands without the DFS functionality, while not interfering with the incumbent radar systems. This would enable new and innovative applications using the Wi-Fi Direct™ technology and other short-range ad hoc technologies.

20. Similarly, there was broad support for aligning U-NII-2B with U-NII-2A and/or U-NII-2C, which would support two additional 80 MHz channels compared to the band plan for existing spectrum.²⁰ Both 2A and 2C today require Dynamic Frequency Selection (DFS) for sharing with government

¹⁷ SES/Intelsat Comments at 1-2 (urging the Commission to “abandon” its approach).

¹⁸ Globalstar at 6; ARRL at 11-12; AASHTO at 11; Toyota at 6; ITSPAC at 1-2.

¹⁹ NCTA at 12-13, Time Warner Cable at 3,10.

²⁰ IEEE 802.11 at 31-32; WFA at 30; Ericsson at 9-10. *See generally* CEA at 11, 12-13 (supporting harmonization generally).

radar systems. Given the NTIA report listing government uses of the band,²¹ and the broadcast television comments concerning broadcaster-owned TDWR, it appears that some version of DFS may be needed in 2B.²² In IEEE 802's view, harmonizing the U-NII-2 sub-bands should be the Commission's goal, recognizing that the specifics of the emissions rules, outdoor use, and sharing technologies will need to be identified based on technical analysis of U-NII sharing with licensed and federal users.

21. Commenters also supported the goal of aligning U-NII-4 with U-NII-3, if such rules are found to be consistent with supporting a sharing case with licensed and federal users in that band.²³ However, commenters noted that sharing solutions developed to address incumbent users in other bands, such as DFS, should not be extended into U-NII-4 unless a specific need for radar avoidance measures is identified. Sharing requirements should be band-specific and compelled by the requirement not to interfere with the incumbent/ system at issue.²⁴ These views agree with those of IEEE 802.

V. Broad agreement exists to tackle the U-NII-2 and U-NII-3 rules as proposed in the Notice to improve DFS and resolve TDWR issues

A. Industry has made plain its willingness to modify rules to improve DFS and band operations that affect TDWR – the issue is ready for decision

22. Commenters indicated broad support for the package of proposals contained in the Notice: applying a revised Section 15.407 to U-NII-2C and U-NII-3, improving device security to discourage user tampering, and making a variety of improvements to DFS rules, such as adopting the new Bin1 test

²¹ See Department of Commerce, "Evaluation of the 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) of the Middle Class Tax Relief and Job Creation Act of 2012," available at http://www.ntia.doc.gov/files/ntia/publications/ntia_5_ghz_report_01-25-2013.pdf.

²² NCTA at 13.

²³ IEEE 802.11 at 31; WFA at 27. But see AASHTO at 11-17, arguing that the power levels for U-NII-3 appear to it to be incompatible with the use of DSRC in U-NII-4. IEEE 802.11 agrees that the final selection of emissions rules for the U-NII-4 band will need to be selected based on interference analysis.

²⁴ NCTA at 12-13.

and changing the mechanism to load the devices during DFS testing to better reflect current uses of U-NII devices. Moreover, there was broad agreement that if this group of rules changes is adopted, there is no need to consider mandates for geolocation databases, additional emissions rules or frequency separation. As will be discussed in this section, with an extensive record and deep understanding of the causes of TDWR interference, IEEE 802 believes that now is the time to resolve these issues, and we urge the Commission to take prompt action. Providing access to 50 MHz of spectrum from 5600-5650 MHz is an important ingredient to ensuring that technologies like IEEE 802.11ac can deliver on their promise. Providing certainty to manufacturers for this spectrum is no less important.

23. Before discussing the specifics of the rules, IEEE 802 wishes to call the Commission's attention to the few comments that suggest DFS is not doing its job of having U-NII devices avoid radar. We do not agree and find no evidence to support such assertions. When DFS was adopted in 2006, the government tested the ability of DFS technology to detect radars represented in the five "bins" identified for industry. Government tests confirmed that multiple devices detected those radars. Later, in testing that was done at the time the TDWR issues came to light, one manufacturer's DFS technology detected the TDWRs – before the Bin 1 test was revised to reflect TDWR operations. Moreover, the enforcement record amassed in the interference cases does nothing to alter our belief that DFS works properly. In case after case, users illegally modified U-NII-3 devices, which have no DFS, to operate illegally in the U-NII-2C band. If there is no DFS, it cannot "work." Therefore, this body of enforcement cases can not logically be used to support the proposition that DFS does not function. In fact, IEEE 802 can find only one enforcement case where functioning DFS did not detect a radar, and that involved illegal use of a high gain antenna which would also be off limits under the rule changes proposed in this docket.²⁵ As discussed below, the record reveals that manufacturers are more than willing to improve security to avoid user manipulation of devices. However, we do not agree with those commenters who take the view that DFS is not a proven technology.

1. Improving DFS and protecting TDWR

²⁵ In the Matter of VP Net, Inc., San Juan PR , File No: EB-11-SJ-0025, DA 12-450, released March 23, 2012. We note that this case involved frame-based technology that is not standardized by 802.11.

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- IEEE 802.11 believes the Commission has a relatively easy job based on the record on these issues. There is broad agreement among commenters about the rules the Commission has proposed and, in the instances where there are conflicts, the underlying technical issues are well understood, thus rendering the matter ready for decision. The Commission can promptly embrace a set of improved DFS-related rules for which there is unanimous agreement:

- Adopt the new Bin 1 test, which includes for the first time TDWR emissions parameters.²⁶
- Adopt the proposed rule to deny users the ability to make a country code selection.²⁷
- Adopt the 15.247 power spectral density rule.²⁸
- Adopt the new spectral density requirement for co-channel sensing (at -62 dBm);²⁹
- Eliminate uniform channel loading.³⁰
- Revise the DFS channel loading test.³¹

24. Next, there is broad support for applying a revised Section 15.407 to the U-NII-3 band, including revising power limits to 1W,³² application of 15.407 unwanted emissions rules,³³ and revising the antenna gain rules.³⁴ Manufacturers and users of point-to-point systems predictably oppose this rule change because it will decrease the reach of point-to-point systems.³⁵ But the Commission has made clear that it is these very systems that are producing the TDWR issue.³⁶ IEEE 802's review of the enforcement cases supports that conclusion. While we would prefer as much flexibility in emissions rules as possible, our conclusion as we enter the fourth year of impaired access to the band, is that the greater benefit to the public is access to IEEE 802.11ac, which can operate using the proposed emissions rules. Point to-point systems have other options: 2.4 GHz, 3.65 GHz, and

²⁶ IEEE 802 at 23, WFA at 9, 17, Cisco at 28-29, TIA at 8-9, WISPA at 18. The record also reveals agreement that this test should be updated on delegated authority. IEEE 802 at 23, WFA at 17, 32, Cisco at 29, TIA at 8-9.

²⁷ IEEE 802 at 23, WFA at 17-18, NCTA at 23.

²⁸ IEEE 802 at 17, WFA at 12, Cisco at 44.

²⁹ IEEE 802 at 23, WFA at 19, Cisco at 48-50, Ericsson at 8, Fastback at 9.

³⁰ IEEE 802 at 24, WFA at 20, Cisco at 50, Ericsson at 8, Fastback at 9. Commenters also supported provisions that would allow for either random or manual channel selection to give manufacturers greater flexibility to design devices that avoid radar. Cisco at 50, IEEE 802 at 24, Fastback at 9.

³¹ IEEE 802 at 24, WFA at 20, Cisco at 50-51, Fastback at 9.

³² IEEE 802 at 17, WFA at 12, Cisco at 43.

³³ IEEE 802 at 19.

³⁴ IEEE 802 at 18, Ericsson at 5, TIA at 11, WFA at 13.

³⁵ WISPA at 2-3, 12-13, Cambium at 3-4.

³⁶ Memorandum to Manufacturers and Operators of 5 GHz Outdoor Equipment, July 27, 2010, from Julius Knapp, Chief Office of Engineering and Technology and P. Michele Ellison, Chief Enforcement Bureau ("We have found that the interference at each location has generally been caused by a few fixed wireless transmitters used by wireless internet service providers (WISPs) and operating outdoors in the vicinity of airports at high elevations that are line-of-sight to the TDWR installations (5 GHz outdoor network equipment).").

TV White Spaces, especially in rural areas where spectrum is lightly used. WISPA's comments point to voluntary database as a solution, and we appreciate WISPA's efforts to address the interference issues to TDWRs, however non-compliant parties operate outside of lawful requirements. The more prudent choice is to discourage high gain deployments of the type that disrupted TDWR using equipment certification rules to minimize the risk.

25. Fastback makes two proposals that IEEE 802 wishes to endorse. First, Fastback suggests optional rules for devices that can detect the specific frequency of the incumbent transmitter. DFS detection within a channel should not require the device to vacate the entire channel. This proposal is particularly important for IEEE 802.11ac, which uses broad channels. Second, Fastback proposes that Commission rules allow background scanning for available channels in order to establish clear channels that devices can migrate to if a radar initiates transmissions.³⁷ Both of these suggestions are positive ones that we recommend the Commission consider.
26. IEEE 802 also notes that there is broad agreement in the record that manufacturers can and should do more to help ensure that devices are not manipulated post-manufacture in ways that allow illegal operation. A significant number of enforcement cases have involved users retuning devices approved for U-NII-3 into U-NII-2C, even though the devices are not equipped with DFS. Had an improved security showing been in force, it would have eliminated most interference cases, based on the record revealed to date.³⁸ Commenters suggested that the Commission take an approach similar to Software Defined Radio security, which uses the certification process to ensure that manufacturers have taken steps to prevent alteration of software or firmware. Cisco notes that one of the recent enforcement cases took this approach, and we believe that the Commission can and should make broader use of it. The Commission's approach suggests that it, too, agrees with IEEE 802's view that improved security requirements should make illegal modification of devices very difficult, recognizing that manufacturers cannot guarantee that security measures will not be overcome by the most intrepid hacker.³⁹

B. Additional protection measures are unnecessary

27. There is also broad support for the primary rule changes suggested by the Notice, including more

³⁷ Fastback at 9.

³⁸ WFA at 15, Cisco at 31, TIA at 11, NAB at 7, NCTA supports at 23, Cambium at 1-2, Fastback at 7, WISPA at 17.

³⁹ IEEE 802 at 16, NAB at 7, WFA at 15-16, Cisco at 32-33, Cambium at 2, Shared Spectrum at 4-5.

restrictive power, unwanted emissions, and antenna gain, the above-described improvements to DFS rules, and improved security, represent a targeted and complete response to the TDWR interference cases.⁴⁰ Additional measures outlined in the Notice – geolocation databases, more stringent out of band emissions rules, and frequency separation requirements – are unnecessary. As commenters have stated, protecting TDWR is best accomplished by focusing rule changes on problems which have been identified and addressing those concerns. In IEEE 802’s view, both the Commission and NTIA have incorrectly characterized the enforcement cases as representing instances of adjacent channel interference. We respectfully disagree. Our examination of those cases and the equipment identified demonstrates that interference was co-channel; the equipment was transmitting on a broad channel (usually 20 MHz) that included the center channel of a nearby TDWR. IEEE 802, and other commenters, therefore do not agree that more restrictive out of band emissions rules or frequency separation rules are required, and we urge the Commission to discard these ideas.⁴¹

28. Commenters also opposed the idea of requiring bandwidth sensing over 100% of bandwidth instead of 80%. Simply put, there is no evidence this aspect of the DFS test is resulting in ineffective detection and avoidance of radar emissions.⁴² IEEE 802 agrees that there is no reason to subject all U-NII devices to this when only outdoor use has been an issue in the enforcement cases.⁴³ As the Commission is well aware, existing rules have resulted in commercial equipment that effectively senses 100% of bandwidth. If a stricter rule is adopted, manufacturers would have to increase sensing bandwidth beyond today’s capabilities which will increase rate of false positive detections. False positives impose a cost because the device must switch channels and therefore initiate a channel availability check. By trying to make bandwidth sensing a “guarantee”, the result does not better protect radars (which are already fully protected), however it does degrade U-NII performance.⁴⁴
29. With respect to geolocation databases, the record reveals some support, however there is a big question about how such a database could be deployed. The larger groups of manufacturers, whose equipment is primarily (but not exclusively) deployed indoors, oppose geolocation databases,⁴⁵

⁴⁰ IEEE 802 at 19-20, WFA at 10, 21.

⁴¹ IEEE at 21-22, WFA at 23-24, Cisco at 38.

⁴² IEEE 802 at 22, WFA at 24, Cisco at 39.

⁴³ Cisco at 39.

⁴⁴ Cisco at 40-41.

⁴⁵ IEEE 802 at 3, 20-21, Cisco at 40, WFA at 22, Ericsson at 7, Shared Spectrum at 2-3, WISPA at 17 (noting its voluntary database should not be mandated).

while a few outdoor manufacturers and database supporters see them as a viable option.⁴⁶

However, as IEEE 802 discussed in its comments, there are significant unanswered questions that raise a tremendous amount of uncertainty including who pays for, and maintains the database?⁴⁷

The administrative complexities of ordering a database into being and mandating its use are substantial, and if the Commission embraces industry's recommendations to improve DFS, are also entirely unnecessary. The equities in this case argue for speed – improved access to 5 GHz spectrum is important to meet growing demand. Introducing a geolocation database not only raises many implementation questions that have not been addressed in this record, it also disrupts existing equipment design. Furthermore, geolocation coordinates that are required for database access may not be available in many cases, especially in indoor environments. Thus, while geolocation databases are an important addition to the spectrum sharing toolkit, they are not a universal solution and should not be adopted as a solution to the TDWR band sharing issue.

VI. Strong record agreement on a host of rule changes that could immediately be adopted

30. The record demonstrates that there is strong agreement that the Commission could also promptly adopt a group of rule changes proposed in the Notice. IEEE 802 urges the Commission to adopt the following rules, in addition to the rules recommended above for improving DFS and solving the TDWR concerns:

- Extend U-NII-3 by 25 megahertz from 5825 to 5850 MHz.⁴⁸
- All U-NII devices to have minimum 6-dB bandwidth of 500 kilohertz.⁴⁹
- Adopt proposed modification of measurement bandwidth in 15.407(a)(5).⁵⁰
- Peak-to-average ratio limit of 15.407(a)(6) should be retained.⁵¹
- Miscellaneous rule changes.⁵²

⁴⁶ Spectrum Bridge at 3-6, Cambium at 2-3, Motorola Mobility at 7.

⁴⁷ IEEE 802 at 20-21.

⁴⁸ IEEE 802 at 17, 26 (improves U-NII access to the band), WFA at 11-12 (rules will be “clear and consistent”), Cisco at 42, TIA at 11, Ericsson at 4, NCTA at 17, Motorola Mobility at 2,3, Fastback at 2, First Step at 3, WISPA at 12.

⁴⁹ IEEE 802 at 18, WFA at 12-13, 20, Cisco at 45. Cisco would apply this rule to all 5 GHz U-NII bands to help ensure that 5 GHz does not become congested with narrow bandwidth applications for which other spectrum is available. Cisco at 45. We agree.

⁵⁰ IEEE 802 at 18, WFA at 12, Motorola Mobility at 4.

⁵¹ IEEE 802 at 19, WFA at 13-14, Cisco at 48.

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- Adopt proposed transition plan.⁵³

31. These rule changes will help support deployment of IEEE 802.11ac in the band and should be adopted immediately. There was no dissent regarding the Commission's plan to add 5825-5850 MHz to the U-NII rules. Enabling devices to use the full range of U-NII-3 spectrum is a significant benefit, and one that the Commission could confer early. Adopting the minimum bandwidth constraint across all bands, an idea supported by one commenter, helps ensure that the 5 GHz spectrum will be a good place for U-NII devices, which utilize broad channels.⁵⁴ Changing the measurement bandwidth in 15.407(a)(5) to 1 MHz received broad support and should also be adopted.⁵⁵ Similarly, retention of the peak-to-average ratio limit contained in 15.407(a)(6) received unanimous support.⁵⁶ There were no objections to adopting the miscellaneous rule changes proposed in the Notice,⁵⁷ and there was broad support for the FCC's suggested transition rule.⁵⁸ In addition, commenters also suggested that after the two year period for permissive changes expires, the Commission should allow manufacturers to make only one permissive change – to upgrade software to reflect the revised Bin 1.⁵⁹ These proposed rule changes are for the most part, unopposed, and the Commission should adopt them immediately.

VII. DFS and the evolution of ad hoc networks

32. Commenters have also recognized the ongoing evolution of IEEE 802.11ac devices from fixed access points communicating with clients to portable client devices that communicate directly with other client devices. As mentioned previously in this Reply, IEEE 802, together with other commenters, recommended adding an option for a low power mode on DFS channels, meaning devices that do not support DFS will be able to operate on DFS channels subject to a power

⁵² IEEE 802 at 24-25, WFA at 31, Cisco at 51-52, TIA at 11, Ericsson at 12.

⁵³ IEEE 802.11 at 25, WFA at 31, Cisco at 52 (noting that the timeline should begin upon the effective date of the new or modified rule, not Federal Register publication), Ericsson at 12 (noting that existing devices should be grandfathered), NCTA at 13,18.

⁵⁴ Commenters unanimously supported a minimum bandwidth emission rule in 15.407. IEEE 802 at 18, WFA at 12-13, 20, and Cisco at 45. Cisco would apply this rule to all 5 GHz U-NII bands to help ensure that 5 GHz does not become congested with narrow bandwidth applications for which other spectrum is available. Cisco at 45. *See also more generally* TIA at 8 (FCC should act to “minimize congestion” as is occurring in 2.4 GHz).

⁵⁵ IEEE 802 at 18, WFA at 12, Motorola Mobility at 4, Cisco at 46.

⁵⁶ IEEE 802 at 19, WFA at 13-14, Cisco at 48.

⁵⁷ IEEE 802 at 24-25, WFA at 31, Cisco at 51-52, TIA at 11, Ericsson at 12.

⁵⁸ IEEE 802.11 at 25, WFA at 31, Cisco at 52 (noting that the timeline should begin upon the effective date of the new or modified rule, not Federal Register publication), Ericsson at 12 (noting that existing devices should be grandfathered), NCTA at 13,18 (allow “reasonable” period for manufacturers to adapt and recommending extending the time to 18 months).

⁵⁹ IEEE 802 at 25-26, WFA at 31-32, Cisco at 52-53.

limitation. We recognize that this will require additional study and we urge the Commission to consider adding this mode to the DFS rules.

1. Enabling new usages and applications in DFS bands with low power mode

33. In response to the Commission's question on whether DFS requirement has in any way limited new applications and the use of the band, IEEE 802 and Wi-Fi Alliance commented that it strongly encourages the Commission to consider a low power mode where U-NII devices can establish ad hoc short range links between devices that do not have DFS functionality without causing interference to the incumbent radar systems in the band. As IEEE 802 noted in their comments, the 60 second CAC and in-service monitoring regulations have limited some WLAN applications in these bands.
34. Motorola Mobility commented that a low power exemption would help allow the use of the bands for connectivity between consumer portable devices.⁶⁰ ITIC noted that requiring DFS for low power WLAN devices in the U-NII-2A and U-NII-2C bands not only imposes additional costs, "but it also limits enabling new and innovative next generation WLAN applications that could be deployed consistent with protection of incumbents, using other interference-avoidance solutions."⁶¹ IEEE 802 looks forward to working with the FCC, the NTIA, and other interested parties to develop a satisfactory solution.

VIII. U-NII-1 proposed revisions

35. As discussed above, various commenters propose aligning emissions rules in the U-NII-1 band with U-NII-2A or U-NII-3. Commenters note the benefits of both. When aligned with U-NII-3, equipment in the U-NII-1 band can be utilized in an IEEE 802.11ac 80+80 configuration for outdoor deployments, which is of particular importance to service providers. As IEEE 802 stated above, the Commission should explore the possibility of alignment with U-NII-3, as that set of emissions rules would provide manufacturers and service providers the greatest flexibility. In

⁶⁰ Motorola Mobility at page 7.

⁶¹ ITIC at page 10.

addition, the parties suggested that the rules be amended to specify that within the U-NII-1 band, the minimum 6 dB bandwidth of U-NII devices should be at least 500 kilohertz.⁶² We agree, because the rule will best ensure the band is used by devices that utilize wideband channelization.

36. There was significant agreement that the U-NII-1 band rules be revised to allow outdoor deployments which both U-NII-2A and U-NII-3 allow today.⁶³ In addition, IEEE 802 and the WFA both discussed the need to eliminate the “indoor-only” restriction because it limits deployment of Wi-Fi Direct devices in the band. These personal portable devices cannot, as a practical matter, be restricted to indoor use.⁶⁴ IEEE 802 therefore urges the Commission to eliminate the indoor-only restriction.
37. Globalstar, the incumbent Mobile Satellite licensee, agrees that U-NII devices can make improved use of the band, and notes that raising the power level to U-NII-2A levels, while increasing the noise floor, would create a “manageable” level of interference. However, Globalstar states that its network can only manage the higher power if devices are confined to indoor use. In their comments, Globalstar states that “Such outdoor transmissions would threaten substantial harmful interference to Globalstar’s NGSO MSS feeder uplink operations at 5096-5250 MHz” IEEE 802 appreciates Globalstar’s willingness to consider changing the rules for U-NII operations in the band, and recognizes the need to share spectrum to increase the public interest benefits of that spectrum. However, IEEE 802 disagrees with the Globalstar analysis and its conclusions regarding the outdoor use of U-NII devices. The model that Globalstar has used is a conservative one, and deserves close review by the Commission. IEEE 802 believes that Globalstar’s interference analysis is based on the change in noise level at the satellite, whereas in a digital telephony system, what matters is the voice quality at the user terminal, not the noise level at the satellite. In an analysis of a Globalstar system link budget, the “composite Eb/No” of both uplink and downlink paths of the forward link was computed. The limiting path is the downlink from the satellite to the user terminal and not the uplink. U-NII devices share the band with Globalstar only with the forward path uplink, so adding any interference to the uplink will still be limited by the downlink. Analysis shows that there is no change in composite forward link $E_b/(N_o+I_o)$ from UNII-1 interference, and there is no

⁶² WFA at 25.

⁶³ IEEE 802 at 27, Cisco at 54-55, 57, Ericsson at 5, Motorola Mobility at 5, Google/Microsoft at 5-6 (sharing techniques less onerous than an indoor restriction can work and favoring harmonized power levels), Cablevision at 6, CEA at 11 (noting “harmonize where feasible” principle). Indoor restriction is a legacy of past allocations and is no longer relevant. CEA at 12-13 (also listing the benefits of harmonization: enabling manufacturers to scale lowers equipment costs, speeds certification & therefore speeds innovation to market, supports 802.11ac), WISPA at 6.

⁶⁴ “Indoor only” restriction is blocking the ability of Wi-Fi Direct to use the band, even when some of the devices (“peers”) are indoors. IEEE 802 at 28 and Appendix, WFA at 25 and Appendix. *See also* Motorola Mobility at 5-6, supporting Wi-Fi Direct use in this band.

degradation to Globalstar forward link voice quality.

38. Moreover, MSS bands are underutilized as evidenced by Globalstar's own efforts to convert its 2.4 GHz spectrum to wireless terrestrial use⁶⁵ including, ironically, a low-power, WLAN service. IEEE 802 does not believe the Commission should protect a service with declining utility. Instead, it should structure its rules to promote a service that is growing rapidly and plays a critical role in the lives of most Americans.
39. In addition, Fastback similarly suggests that "transportable devices" should be limited to indoor use. Specifically, Fastback wants "transportable devices" to be limited to 50 mW at a peak power spectral density of 2.5 mW/MHz as per current U-NII-1 band rules. However, Fastback accepts that it may be completely reasonable to allow a higher conducted output power limit for such "transportable devices" so long as the maximum EIRP of 200 mW is demonstrated.⁶⁶ Given the enormous demand for U-NII devices, generated by the increasing popularity of WLAN, IEEE 802 believes that the Commission should be seeking to provide rules that maximize flexibility for power and emissions in U-NII-1. IEEE 802 therefore recommends that the Commission investigate whether U-NII-3 emissions rules can be applied to U-NII-1, or, at a minimum, the U-NII-2A rules.

IX. U-NII-4 band sharing case – broad agreement around process and goals

40. IEEE 802 submits that there is a considerable amount of agreement in the record on the U-NII-4 band – agreement that can become a strong foundation for how the Commission moves forward. Commenters agree that Dedicated Short Range Communications (DSRC) devices must be protected from harmful interference from U-NII devices, and that federal or Commission-licensed users in the band would similarly have primary rights to the spectrum.⁶⁷ There is also agreement that for DSRC, the technical problem of whether and how U-NII devices might share spectrum is something that

⁶⁵ Globalstar Petition for Rulemaking: http://www.globalstar.com/en/ir/docs/FCC12-Petition_for_Rule_Making_Nov_13th.pdf.

⁶⁶ Fastback at 6.

⁶⁷ IEEE 802 at 30, Cisco at 58, 62-63, CEA at 14-15, 16, TIA at 15-16, GM at 2, AAM-GA at 2-3, 33 (DSRC requires "significant" protection) Toyota is not "conceptually opposed" to sharing, but FCC must do its homework with other agencies and technical due diligence to assure minimal interference risk. Toyota at 1-2. *See also* Omni Air at 1. *See Generally* Mercedes Benz comments, similar to GM, Savari Comments at 30-32 (noting the Notice recognizes that DSRC is primary and U-NII operations must not interfere), CA DOT at 2 (DSRC has "valuable protections" from interference, per FCC rule) and NTSB 1-4.

would benefit from live exchanges of information between industry representatives, a process that has already started. Commenters suggested various forms of Commission involvement in the process, and all have agreed that a solution would most likely result from dialogue beyond the comment round.⁶⁸ Significant agreement also exists that the Commission should take no action adopting final rules for U-NII-4 sharing with DSRC unless and until a technological solution can be thoroughly tested and vetted, and all parties have had an opportunity to weigh in with concerns and comments.⁶⁹ There is broad agreement that if a particular sharing concept or concepts appears meritorious, those ideas will need to be thoroughly tested in order for all stakeholders to have confidence that they will work, and that the Commission will need to develop robust equipment compliance rules and procedures to ensure that devices will adhere to requirements.

41. As the entity that sets standards for both IEEE 802.11ac and IEEE 802.11p, which is the candidate to become the standard DSRC technology, IEEE 802 has noted the comments from stakeholders in the IEEE 802.11p community who are sceptical that sharing spectrum will work.⁷⁰ However, IEEE 802 is optimistic that a mutually acceptable solution can be reached. That said, we recognize that the automotive community, including the US Department of Transportation and its various component entities, have worked long and hard to develop a technology to make the nation's highways safer and to save lives. That work has not been done with a view toward sharing the radio resource with other systems. Therefore, U-NII devices seeking to operate in the band face challenges in learning to work around a radio system not designed to co-exist with U-NII operations. If the IEEE 802ac technology needs to be modified in order for sharing to work, IEEE 802 is prepared to engage that work. While the technological challenge is very real, IEEE 802 believes that the benefits of successfully solving the challenge are large and could extend to both radio ecosystems. IEEE 802 also believes that our member experts are best positioned to assist the Commission, and the stakeholders, in the technological due diligence that must occur if U-NII devices are to be allowed to operate in the DSRC band. Our members are already engaging in dialogue around these issues, and we stand ready to assist the Commission in any way possible.
42. Parties are now beginning the dialogue to examine possible sharing scenarios, both within the context of the comment round and in engineering forums outside of it. Qualcomm has proposed in its comments a sharing solution that seeks to protect, to the maximum extent possible, the most

⁶⁸ IEEE 802 at 30, WFA at 27, Cisco at 65, Cambium at 5. Many commenters note the FCC should await the input of the NTIA before taking action. AAM-GA at 7-8, 31-32, GM at 3, NTSB at 4. Utah DOT at 2. *See also* Toyota at 6-7.

⁶⁹ Savari at 34-35; ITS America at 34-25; Toyota at 5-6.

⁷⁰ CA DoT at 1-2, AAM-GA at iv, 6.

important DSRC channels by designating a DSRC-only set of channels at the top end of the band that would not be shared, allow sharing for the remaining spectrum, and encourage the shared DSRC users to take advantage of the same 20 MHz channelization common to WLAN devices. Qualcomm notes several important benefits if the shared DSRC channels could migrate to 20 MHz. WLAN devices would not need to be modified to accurately detect and yield to DSRC devices, thereby producing a more reliable sharing environment for DSRC users. Furthermore, individual DSRC device transmissions would occupy less airtime compared to a 10 MHz channel.⁷¹

Qualcomm also discusses options for preventing out-of-band WLAN emissions from spilling into the DSRC-only channels. In addition to the Qualcomm proposal, discussion among members of IEEE 802 is examining the use of IEEE 802.11's "listen-before-talk" mechanisms that could be leveraged to listen for DSRC device transmissions and assign them priority.⁷² For example, by half-clocking the CCA functions on IEEE 802.11ac devices which today perform CCA on multiple 20 MHz preambles, it may be possible to use the native functionality of IEEE 802.11 systems to create sharing capabilities without making any changes to DSRC (IEEE 802.11p) devices. Relying on information in the preambles of IEEE 802.11p also helps because as the technology evolves, the various IEEE 802.11 task groups can cooperate to ensure that the U-NII listening mechanisms are capable of performing their function accurately. There are pros and cons to both approaches, and IEEE 802 urges continued examination of each through reply comments and continuing dialogue.

43. Qualcomm proposes that sharing by unlicensed devices be limited to the lower 45 MHz or lower 55 MHz of the DSRC band, and that transportation stakeholders could move the vehicle-to-vehicle safety channel from channel 172 to the unshared upper part of the band. There are several issues that arise. First, there is currently a second higher power public safety channel allocated in that band, raising concerns about how that modification might affect system operations. Secondly, the upper part of the band is adjacent to a band used by high-power satellite uplinks which are widely deployed in the US and there are concerns that these uplinks could significantly impact the performance of the safety systems.
44. The CCA approach allows sharing of all of the DSRC channels, however further investigation is necessary to determine if this is a viable solution. It is worth noting, however, that neither the Qualcomm nor the CCA approach requires detection mechanisms like DFS.
45. Unlike some other commenters, IEEE 802 does not recommend that the Commission establish a

⁷¹ Qualcomm at 12-16 (noting that for its proposed shared spectrum, its proposal results in a relatively small performance differential for 20 MHz at velocities below about 65 miles per hour).

⁷² See <https://mentor.ieee.org/802.11/dcn/13/11-13-0552-00-0wng-802-11p-dsrc-and-802-11ac-coexistence.ppt>

formal advisory board to help it investigate possible sharing solutions. The process of setting up such a board is time-consuming, resource-intensive, and has generally been most useful when tackling broad policy issues and best practices. It has not been applied to a radio sharing problem. In the view of IEEE 802, the community of people with the relevant knowledge of the two radio systems at issue in this proceeding is of a manageable size. By working cooperatively together, and utilizing the Commission's ex parte process, outcomes from industry dialogue can be brought forward to the Commission staff and placed into the public record for examination by all stakeholders, including the NTIA and US DoT most expeditiously. Commission staff can also direct questions to specific parties. In addition, the Commission has capability, through Public Notices or other administrative mechanisms, to request comment on proposed sharing mechanisms, test plans and reporting of test results. IEEE 802 sees no impediment to active Commission and stakeholder involvement. The administrative process is sufficiently flexible to support consensus-building and robust testing.

46. IEEE 802 notes that beyond DSRC, there are other allocations in the band that require the Commission's attention. SES/Intelsat argue that the Commission's characterization of spectrum for fixed satellite services as "lightly used" is incorrect, and states that the band is not utilized for services inside the US due to a restrictive footnote in the Table of Allocations.⁷³ IEEE 802 submits that the Commission should focus on licensed uses of the band inside the United States. SES/Intelsat then argue that U-NII use of the band could result in adjacent channel interference into conventional C-band uplink spectrum. As a basis for its claim, SES/Intelsat argue that the TDWR cases demonstrate adjacent channel interference. IEEE 802 disagrees. The enforcement cases released to date demonstrate co-channel interference predominantly caused by non-DFS devices being illegally used in the U-NII-2C band.
47. AARL also states that the secondary amateur service might be affected by U-NII device use in the band, while simultaneously stating that its experience in sharing with U-NII devices in U-NII-2C is "generally positive." IEEE 802 submits that the amateur service will be challenged by the advent of DSRC at least to the same extent as it would be challenged by U-NIIs in that the two radio systems will be prevalent where people live and work. Because both are relatively low power, amateurs should be able to work around DSRC, and in doing so will naturally avoid U-NII operations.
48. Commenters also expressed concern about sharing with federal systems in the band. Many emphasized that DFS should only be required if there is a demonstrated need to avoid radar in the

⁷³ SES/Intelsat at 4-5.

band. They also noted that since DSRC devices have no DFS requirement, there appears to be an open question as to whether DFS should be required of U-NII devices. IEEE 802 also notes that if federal radar use of the bands is geographically limited, then it may be possible to utilize geographic exclusion zones in lieu of DFS to avoid loading the U-NIIs with DFS sensing that occupies U-NII receivers and prevents transmission. IEEE 802 looks forward to working with the Commission and NTIA to examine and resolve these issues.

X. U-NII-2B rules can protect broadcaster Doppler Weather Radars (“DWR”) to the same extent as U-NII-2C rules protect government TDWRs

49. Manufacturers and users of DWRs operated by broadcast television stations stated that U-NII operations in the U-NII-2B band could adversely affect their operations. These parties made various assertions about the effect of harmful interference on U-NII operations, and based many of their comments on the government TDWR experience.⁷⁴ IEEE 802 agrees, as do all commenting parties, that incumbent licensees should not suffer harmful interference, and that U-NII equipment certification rules must be designed so that equipment entering the market does not cause interference. As the record in this proceeding makes clear, the IEEE 802 industry takes its responsibilities to the Commission and to incumbents seriously. IEEE 802 and our members actively participated with government stakeholders in the initial opening of the U-NII-2C band in 2006, and again actively worked alongside government stakeholders when TDWR interference arose and we were briefed on it in 2009. Many of our positions in this docket reflect that work, and the view that rules must be improved to better protect government TDWR.
50. We believe those same rules can protect broadcast DWR which is performing a mission similar to government TDWR. First, IEEE 802 notes that the improved rule changes we recommend in this docket, when applied to the U-NII-2B band, including revising rules for U-NII-3 and improved security for 15.407 U-NII devices, should similarly protect broadcast DWR. Second, the revised Bin 1 test should ensure that U-NII devices can detect emission patterns of broadcast DWRs, and we note no broadcast DWR commenter objected to the revised Bin 1. Broadcast DWRs should not require special protections beyond the mechanisms and requirements that apply to sharing with

⁷⁴ Baron at 4; Hubbard at 2-4.

government radars.⁷⁵ As previously stated in these reply comments, we disagree that the government TDWR cases present a case of adjacent channel interference and we therefore do not support regulations to protect against a phantom problem. We also disagree that a requirement to change the sensing requirements to 100% of bandwidth represents a meaningful improvement in detection capability, and we remind the Commission that adoption of such a rule represents a very real degradation in the ability of U-NII devices to perform their function.

51. Earth exploration satellite services also use the band and commenting parties expressed concern about how U-NII devices might be able to share with these systems. IEEE 802 looks forward to working with NTIA and FCC on ideas for how to protect EESS using mitigation techniques, along with other federal systems, such as aeronautical navigation, in the band.

XI. Health care prioritization

52. AAMI suggested that the Commission adopt a priority designation for health care communications, which appears to be restricted to wireless communications inside health care facilities. AAMI's comments indicate that its members wish to deploy IEEE 802.11ac technologies, and to do so in a "controlled" environment, where they would have access to cleaner spectrum so that wireless could be used to address clinical needs. AAMI suggests a channel could be made available in either the U-NII-2C or U-NII-4 band for such purpose. To achieve priority, AAMI suggests the Commission adopt a geolocation database or beaconing technology so that non-priority users would be forced on to other channels when in or near a health care facility.⁷⁶
53. In the view of IEEE 802, enterprises, and in particular large enterprises like hospitals that exclusively occupy a civic address, have the ability to manage unlicensed spectrum on premises to achieve the quality of service they need. Multiple vendors offer tools that enable network administrators to ensure that only authorized operations are permitted, and to continuously monitor the spectrum environment to assure quality of service. These tools are an obvious choice for institutions that want to utilize IEEE 802.11 commercial technologies in their networks. The existence of these tools raises the bar for AAMI's proposal, and AAMI does not explain why its membership believes on-premises spectrum management is not an option. Moreover, dedicating priority access to spectrum on behalf of some institutions comes at a very high cost to the larger

⁷⁵ Baron at 14-17, NAB at 4-5.

⁷⁶ AAMI at 1-11.

IEEE 802.11 community, in that AAMI seeks a geolocation database or beaconing technology for all devices, in order to avoid what AAMI estimates is 0.5% of the geography that would constitute the exclusion zone. Neither geolocation databases nor beaconing systems are used today in U-NII-2C, and IEEE 802 contends that the sharing issues with TDWR are resolvable without these mechanisms. In addition, it appears that the sharing issues with DSRC devices in the U-NII-4 band are may be resolvable on the strength of the listen-before-talk technology already embedded in IEEE 802.11 radios, along with some form of DFS if necessary to detect federal radar systems.

XII. World Radio Conference Preparation

54. IEEE 802 joins other parties in urging the Commission to move forward with this proceeding as expeditiously as possible, in order to provide a firm foundation for the US position going into the next World Radio Conference. Other parties have noted that the NTIA set forth milestones throughout 2013 and 2014 for coordinating international studies needed in preparation for the WRC-15, stating that it is doing so to “best position the United States for work in the ITU-R as other countries will inevitably bring forward studies on these bands.” We agree that the Commission can best support the NTIA by moving this proceeding expeditiously, developing domestic approaches to sharing that can be shared at the WRC-15.⁷⁷ In doing so, we take issue with suggestions that the Commission is forbidden from taking final action until it has the permission from the international community via a WRC resolution. If anything, the comments in this proceeding make clear that regulators all over the world are dealing with explosive growth in wireless data that will in large measure be carried over IEEE 802.11 networks. Regulators cannot afford to wait for an international treaty to bless the expansion of access to spectrum for broadband wireless technologies. Waiting until 2015 (or even 2016 if the WRC schedule slips) is unacceptable. Moreover, the international debate can be better served if there is solid analysis available from one or more jurisdictions on spectrum sharing.

XIII. Conclusion

55. IEEE 802’s review of the comments in this proceeding indicate that there is strong agreement to

⁷⁷ TIA at 7, NCTA at 13, Ericsson at 3.

proceed in a few areas to immediately change rules affecting access to existing bands. For additional bands, new work remains to be done, and in many cases there is a willingness to discuss the issues and allow technical data to drive the Commission to a solution. IEEE 802 believes that this proceeding is an important one that could establish a much improved opportunity for IEEE 802.11ac to meet the demand challenges that are imminent. We look forward to working with the Commission staff, the NTIA, and other stakeholders, on this extremely important proceeding.

Respectfully submitted,

/s/ Paul Nikolich

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